PNK
Const Mater
Fire proofing

177-42

Asbestos: four more months

In my article on asbestos, talc, and cancer ("The Lethal Powder Puff?", Voice, October 14) I reported that asbestos insulation is currently being sprayed at the World Trade Center construction site in lower Manhattan. According to the best information available, asbestos spraying at that location has stopped completely, and not partially as I believed. As an asbestos substitute, World Trade Center contractors are using Cafco DCF, a rock wool type product. Since the spraying of asbestos looses millions of microscopic fibers of this mineral into the air we breathe, and since these fibers can provoke cancerous changes in the human body, this appears to be a significant step forward.

But, asbestos spraying continues at dozens of sites in and around New York and other cities. In addition, millions of people are exposed to smaller quantities of asbestos in common household products such as ironing board covers, plasterboard, and potholders. Air conditioning ducts in new buildings are frequently lined with asbestos. Clouds of dust that billow up from the demolition of old buildings that were constructed with asbestos materials also contain quantities of this mineral.

As far as anyone knows, Cafco DCF is harmless to human health. According to the Industrial Health Foundation in Pittsburgh, Cafco should be classified as simply a nuisance in the air, like dust. Some health authorities and researchers would also classify the Industrial Health Foundation as a nuisance, since it is sponsored and controlled by private industries on whose products it passes judgment. In the past this foundation has had kind things to say about cigarette smoking and bad things to say about people who believe black lung disease is a threat to coal miners.

Unfortunately, there is only one way to really test new products like Cafco. Use them and see what happens. The hard evidence doesn't usually come in for years, however. It took a century of heavy industrial use to expose the killer qualities of asbestos. And even now we're still being exposed to this stuff, since New York City's new law against spraying it won't go into effect until next February. Attempts to get the city to tell me just where asbestos is now being sprayed have so far been futile. Meanwhile, you can do your part in removing asbestos and nuisance-type materials from the air. Ready? Breathe . . . deep.

—Clark Whelton

PLAINTIFF'S EXHIBIT PX-635

Asbestos and a Worker's Death

Exposure in Building Trade Center Blamed

By Barbara Fischkin

Hugh Bernard Lawrence Gallagher stood on a scaffold 110 stories high and watched as a final piece of structural steel, ceremoniously decorated with a flapping American flag, was bolted onto the still-unfinished north tower of the World Trade Center. As chief steel inspector for one of the world's most famous buildings, it was Gallagher's job to make sure that the ultimate slab, like all the others before it, was put on right.

That was 15 years ago this month. Gallagher was then 55, a confirmed bachelor who was both exacting and sentimental about his work on what was to become New York's tallest structure. Those who knew him say that on that windy December day when the first tower was "topped off," Gallagher — known as "Hughie" to friends, "Barney" to relatives — took many proud, deep breaths.

Deep breaths and strong lungs had always figured in his life. As a Navy diver during World War II, he plunged into the Pacific to search the wreckage of sunken ships. He gave bagpipe lessons at an Irish dance hall — his parents were from County Donegal — and played the pipes every year in the St. Patrick's Day Parade.

But over Labor Day weekend this year, Hughie Gallagher died gasping for air. In a lawsuit filed before he died at age 69, Gallagher blamed a now-banned asbestos fireproofing preparation that was sprayed on almost 3,000 steel trusses on the lower floors of his beloved World Trade Center tower. Gallagher, like other workers there, said he had been exposed to the spray without being warned that he needed protection such as masks and respirators.

Gallagher is believed to be the first among the workers on the World Trade Center to die from malignant mesothelioma, a cancer of the lining of the lungs, chest or abdomen that has been strongly linked to exposure to asbestos fibers. There are grim predictions that other deaths may follow.

Meanwhile, the trade center's asbestos saga has come full circle. Now, months after Gallagher's death and more than a decade after he claims he was first exposed, the Port Authority of New York and New Jersey, which runs the complex, has decided to remove the asbestos as soon as it finds a safe way to do it. The process is expected to cost millions of dollars and take as long as eight years.

At least one other lawsuit has been filed by a worker who claims he became ill as the result of exposure to asbestos at the tower, now called World Trade Center One. John Cahill, 68, of Queens, a former construction inspector and an old friend of Gallagher's, was diagnosed as having asbestosis, a scarring of the lungs that causes shortness of breath.

Photo by Donna Dietrich

John Cahill, above, and with a jacketless Hugh Gallagher atop World Trade Center One, at left.

Because construction workers are employed at many sites — and because smoking is common among them — it is generally difficult to determine exactly what made them ill. For example, a sheet-metal worker who died from mesothelioma several years ago had worked at the World Trade Center and numerous other sites where he was exposed to asbestos. This summer, a 49-year-old elevator builder, who worked for about five years on the trade center's construction, died of lung cancer. His physician said he smoked enough cigarettes to contract the cancer. (According to some scientists and physicians, however, a person who smokes and is exposed to asbestos has five times the chance of getting lung cancer as smokers who are not exposed. Smoking also increases the chance of death for those who have asbestosis).

Preliminary data taken from a Montefiore Hospital study of about 800 sheet-metal workers with 30 years or more experience points to what may be some other cases. Union officials say it is likely some men in the study worked on the trade center while the asbestos was being sprayed. The study showed that 20 percent were likely to have asbestos-related diseases other than cancer.

"There's going to be a significant amount of disease to come from that building," says Miles O'Malley, executive director of the New York chapter of the White Lung Association, a national organization for those who have been exposed to asbestos. Dr. Irving J. Selikoff, an internationally recognized expert on asbestos-related disease and a professor emeritus of the Mount Sinai School of Medicine in Manhattan, recommends that "all people who have worked at maintenance at the World Trade Center be examined as soon as possible."

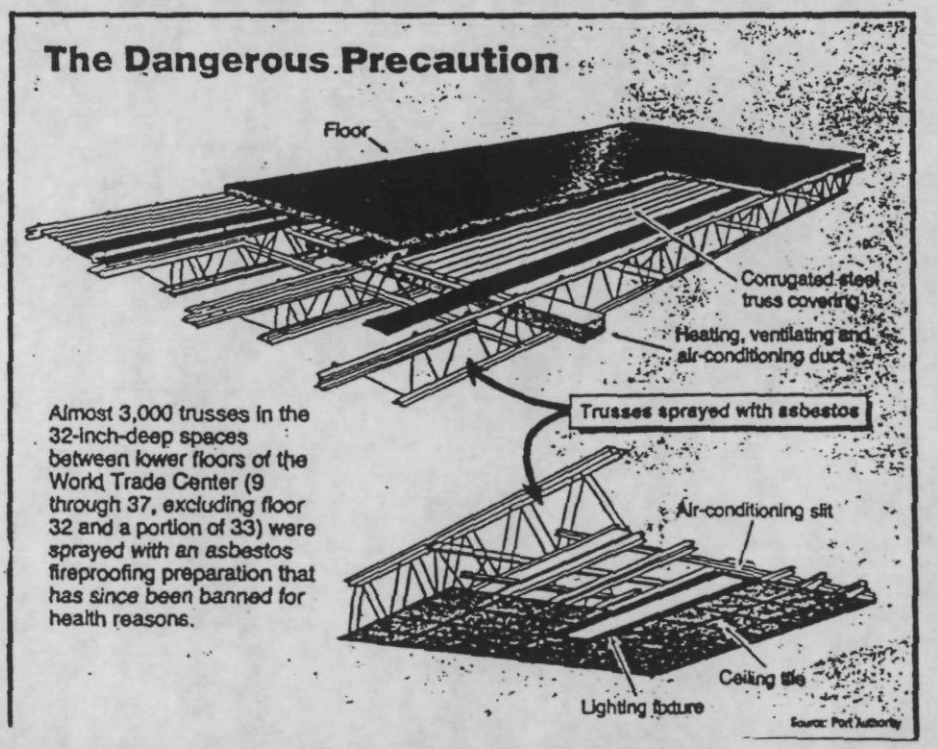
But, as O'Malley and Selikoff point out, the trade center is far from an isolated case. Rather, it is a symbol of a much larger problem.

The U.S. Environmental Protection Agency estimates that of 3.6 million buildings used by the public in the country — including offices, libraries and apartment buildings with more than five units — 730,000 contain asbestos.

Particularly during the 1960s and the very early 1970s, many buildings were sprayed with the same type of asbestos fireproofing used at the World Trade Center. Many workers who came in contact with the substance did not know it was dangerous until years later, in part because diseases linked to asbestos exposure take many years to develop. Now, however, there is widespread concern about the material, which, as it ages, emits fibers that are dangerous to inhale. The dangers also have prompted a controversy over whether it is safer to try to contain the asbestos already in buildings or try to remove it, thus risking release of the fibers. Last month, the City Council passed new restrictions — among the country's most comprehensive — for workers who remove asbestos from buildings.

Gallagher and Cahill are also typical of the types of workers exposed to asbestos. Gallagher worked at shipyards in Canada and Brooklyn and could have come in contact with asbestos at those jobs, although he told his attorney that his only other exposure occurred when he worked at the World's fair in Flushing Meadows in the 1960s. Cahill was a heavy smoker until he became ill. Gallagher's attorney, Norman Landau, said that his client, who retired in 1982, also was exposed while supervising remodeling and alterations after the tower was built. The trusses that had been sprayed with asbestos were coated with a paint-like sealant to prevent fibers from escaping. But Landau says that the trusses, located in areas above the dropped ceiling, are disturbed when repairs are made and the fibers escape anyway.

Selikoff plans to study Gallagher's case. About



Asbestos and a Worker's Death

—Continued from Page 7

Gallagher's possible exposure in shipyards, where asbestos was widely used, especially during World War II, he says, "Does that mean the exposure at the World Trade Center was immaterial? No. Because the effects of asbestos are cumulative. It's important once you have been exposed not to have any more."

Cahill has filed a worker's compensation claim with the Port Authority. He and Gallagher's estate are also suing Tishman Liquidating Corp., which, under another name, was the general contractor for the World Trade Center; U.S. Mineral Product Co. Inc., which, it is believed, bought the asbestos and manufactured the spray-on application, and Mario and Di Bono Plastering Co. Inc. , a subcontractor that sprayed the asbestos on the trusses. Johns-Manville, which is believed to have provided the raw asbestos is no longer named in the suit because it has reorganized under Chapter 11 of the federal Bankruptcy Code. The reorganization of Johns-Manville, one of the largest asbestos fibers producers, was caused by the many asbestos-related claims and awards against the company.

New York State has a statute of limitations providing that such suits must be filed within three years from the date of exposure to asbestos. But attorneys disagree over whether that means the date of an individual's first — or last — exposure.

The Port Authority has declined to comment on the cases and an attorney representing U.S. Mineral in the Cahill suit did not return calls to his office. Attorneys for U.S. Mineral, Tishman and Mario and Di Bono in the Gallagher case say that his exposure did not come from the World Trade Center. Michael M. Futterman, who represents Tishman and Mario and Di Bono mentioned Gallagher's shipyard exposure. The attorney, who also represents those companies in the Cahill case, would say only that Cahill was exposed someplace other than the World Trade Center. Cahill's attorney, Emmet Agoglia, said Cahill's only exposure was at the tower.

Ray Gomez, a spokesman for the newly reorganized Manville Corp., says the company will not comment on specific suits. He added, "We've never denied that those diseases are caused by asbestos. There's a clear link between asbestos and asbestosis . . . in . . . [mesothelioma] also there is a very direct link to asbestos. That's something that not only Manville but the industry as a whole has never denied."

But attorneys and physicians in the United States and Britain have claimed that for decades asbestos companies did not warn workers about the dangers of working with their product, even though those dangers were known. For example, Landau has a U.S. Navy pamphlet from 1943 that tells workers to take precautions when working with asbestos. But he says that in 1969 Gallagher was never warned to take those precautions.

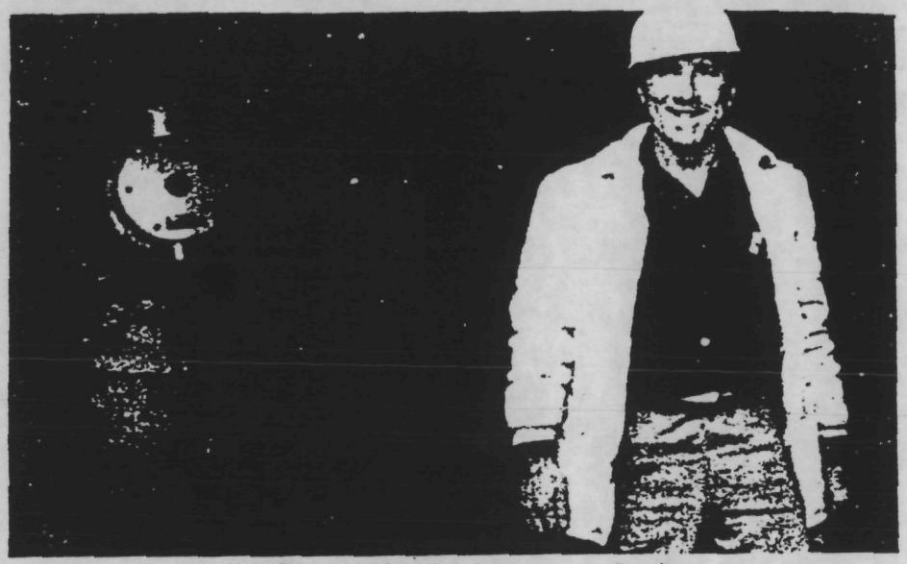
• • •

Hugh Gallagher had been a rarity in the construction trade — a health nut who refused red meat and lunched on sandwiches made with whole wheat bread and mounds of lettuce while his co-workers ate hot dogs. He had smoked a little. But only in his youth. Gallagher's younger brother, John, 64, who runs an Irish bar and restaurant in the Throgs Neck section of the Bronx, cries now, whenever he talks about him. They were very close and he looked forward to his older brother's retirement so they could spend time swimming, talking and going to the markets to buy food for the restaurant, "Charlie's Inn." He was only mildly concerned that his brother had given up playing the bagpipes; he thought that he was just a little tired.

But then, one day in July, 1984, when the two were swimming in the Long Island Sound at their regular spot near the Whitestone Bridge, John Gallagher had to pull his brother out of the water.

"He was following me out. I turned around and I said, 'What?' He was gasping. He said, 'I don't know. I can't catch my breath.' I pulled him out and we sat on a rock and talked and he said, 'I don't know what's the matter with me. . . . later on, he couldn't get his breath, he lost all his strength; he didn't have any strength left for doing anything. He only lived around the corner from the place. The last day he was here he walked over and it took him an hour. I walked him home. The next night I took him to the hospital. They never let him out after that. It's the worst way to die, suffocating."

Hugh Gallagher's death was the second industrial accident in his family in as many generations. When he was a child his uncle, also named Hugh, died when he fell into a furnace in Scotland. After that the family stopped calling young Hugh by his first name, thinking it would be bad luck.



Hugh Gallagher in his work clothes at a construction site.

he mentioned that he hoped John Cahill would carry on his fight. Cahill speaks in a raspy voice. He wheezes, he stops to cough or catch his breath. He said that, like his friend Hughie Gallagher, he had pictured an active retirement. Now there are many days when all he does is walk down to the Off-Track Betting Parlor near his house. He usually sends someone else in to place bets for him; the smoke bothers him too much.

Cahill says that after he and Gallagher became ill, "We talked together about breathing and when not to go outside, when the air was heavy staying inside . . . Sometimes I'd say, 'Why the hell didn't they give us something to wear?' I'd say 'Hughie, did anybody ever tell us this stuff was poison going at your lungs?' Hughie'd say, 'No one.' . . . I say the dangers of a construction job are falling and tripping, so there are barriers put up. Nets are strung up so that if you do fall, you fall into a net. What do you say about something you can't see so you're not warned?"

In an Aug. 13, 1979, letter to the Port Authority, Selikoff said that Cahill has asbestosis and that "review of his work experience at the World Trade Center indicates that there has been ample opportunity for asbestos exposure, sufficient to have caused his present abnormalities. He was on hand at the time of spraying of asbestos for the fireproofing of the steel structure . . . This same source of exposure, however, continued after spraying ceased, with the material falling from the beams, contaminating the local areas. From what Mr. Cahill told me, this "flaking off' is still going on . . . In my opinion, therefore, there is clear causal relationship between Mr. Cahill's current condition and his employment with the Port Authority."

• • •

In 1969, when the Port Authority began spraying the World Trade Center, it was following a procedure common in the construction trade, which revered asbestos for its fireproofing qualities. But Selikoff and his staff physicians at Mount Sinai's Environmental Sciences Laboratory already knew asbestos was dangerous. They began testing at the trade center site soon after the spraying began and in the process found clumps of asbestos, some of which had floated blocks away in downtown Manhattan. At the site itself, workers described snowstorm-like scenes of floating asbestos.

Dr. William Nicholson, who performed the tests, said that the trusses were generally covered with tarps to keep the fibers from escaping but "as soon as they took the tarp down it rained and it (the asbestos) all fell off. It was thick for a five block area . . . it just fell off, it just came down in chunks and pieces and was littered all over the working area."

Selikoff convinced the Port Authority to stop [illegible] and switched in 1970 to a nonasbestos fireproofing, which was readily available, after floors 9 through 37, excluding floor 32 and part of 33, were sprayed with asbestos. It put a paint-like sealant on the trusses that had asbestos. But there is disagreement among experts about whether such sealants work. In the ensuing years, construction and maintenance workers have spoken about seeing clumps of asbestos flaking off when they go into the area above the tower's dropped ceilings where the trusses are located.

Seventy-five percent of the air in the tower is recycled and it runs through ducts near the trusses. Frank Boyce, project coordinator for the trade center's asbestos abatement project, said that asbestos is not getting into the tower's air supply, particulary since the ducts are sealed. A monitoring program is in effect so that tests are made after repairs are done in the dropped ceiling area, to make sure that dangerous amounts of asbestos fibers have not been dislodged. Boyce said that all tests have show conditions well below federal danger levels. A process called phase contrast microscopy is used to determine the levels. Selikoff has criticized that technique saying it does not pick up the smallest — and most lethal — fibers. He said they should use a more exact process called electron microscopy. "If you're trying to see the surface of the moon, you wouldn't use binoculars," Selikoff said.

Last week in an office on a floor sprayed with asbestos, workers climbed on a table to take down a tile from the ceiling. A minuscule speck of white floated to the floor. Above it were pipes coated with white material that did not seem to be covered with the type of colored sealant that was used. "Now that we know it's here we'd rather not have it," said an office employee.

Daniel Censullo, assistant director of physicial facilities of the Port Authority's World Trade Department, said that the Port Authority is trying to figure out how to remove the asbestos because so many precautions have to be taken, including special suits for workers and chambers to keep the asbestos from escaping, whenever a tenant wants a repair or renovation. He said the decision to remove the asbestos has nothing to do with the suits filed by Gallagher or Cahill.

Unlike the furnace fire that killed Hugh Gallagher's uncle, asbestos looks harmless. There are experts who also believe that, unlike a fire, asbestos fibers cannot be put to rest. They say that in those who have inhaled a great amount of asbestos there are generally some fibers that just do not decompose. "If you take a corpse and cut it up you can find those things there," says Dr. Martin S. Rutstein, a professor of geology at the State University College at New Paltz who works with asbestos. "It never dies, itself, the fiber goes on forever," Cahill says. " It's indestructible. We can't get rid of it, can't get it out."

the village VOICE 20c

THE WEEKLY NEWSPAPER OF NEW YORK • Vol. XV, No. 18 • New York, N. Y. • Thursday, April 30, 1970

City Bans Asbestos at Trade Center

Responding to the spreading alarm over asbestos, which has been linked to cancer and deadly lung diseases, Commissioner of Air Resources Robert N. Rickles has halted asbestos spraying at three construction sites, including the World Trade Center. Two remaining sites in the city have voluntarily discontinued spraying.

The use of asbestos was stopped by show-cause orders delivered to contractors who were not following interim regulations announced by the Department of Air Resources on April 13. The Department maintains eight rooftop monitors in lower Manhattan, in addition to a team of asbestos inspectors who visit sites where asbestos is being sprayed as fireproofing heat-insulation.

An asbestos substitute has been developed by a private company and presented to Air Resources. The World Trade Center will begin using the rock wool substitute, although the chemical formula has yet to be examined. Rickles is satisfied, however, that the particles of the new substance, unlike asbestos, are too large to be inhaled.

In a letter to Environment Protection Administrator Jerome Kretchmer, Dr. Myron Malamed of Memorial Hospital for Cancer and Allied Diseases writes: "Asbestos fibres are virtually indestructible. Once in the air they can be counted upon to persist indefinitely.... The prospect of spraying thousands of tons of asbestos into the air staggers the imagination."

—Jonathan Black

PLAINTIFF'S EXHIBIT PX-596

PLAINTIFF'S EXHIBIT
PX-619

Environmental Sciences Laboratory
Mount Sinai School of Medicine
of The City University of New York

INSULATION HYGIENE PROGRESS REPORTS

FROM THE INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM

JUN 17 RECD

Irving J. Selikoff, M.D., Program Director
Vol. 2, No. 2 Summer 1970

This asbestos worker is applying insulation in the unventilated and confined space of a ship's engine room. Note asbestos-containing material on his overalls.

NYC Leads USA – Sets Rules For Spray

In a historic action, the Environmental Protection Administration and the Department of Air Resources of New York City have promulgated interim orders governing the spraying on City construction sites of any insulation material containing asbestos.

First Such Action

The orders went into effect April 13. They detail the steps that must be taken by spray contractors during application. These steps will minimize exposure to spray applicators, to other construction workers on a job site, and also to the general population living or working nearby.

This action by New York City is the first such in the United States. It brought to fruition a cooperative effort by Mount Sinai School of Medicine's Insulation Industry Hygiene Research Program, New York City's Department of Air Resources, and various industry groups which began last summer.

As part of this cooperative effort, a joint program of asbestos sampling and analysis was initiated by Mount Sinai and the Department of Air Resources last July. At the same time the Sprayed Mineral Fiber Manufacturers' Association and the New York City Plasterers' Association met to establish industry safety practices and control procedures for spray application. (See Fall 1969 issue of *Insulation Hygiene Progress Reports.*)

In addition, consultation on various aspects of the problem of spray insulation took place between IIHRP staff and building owners, architects, general contractors, and, especially,

(Continued on next page)

Shipyards Tour Shows Hazards to Workers

Air samples taken from ship compartments in eight shipyards of the Gulf Coast are now being examined for asbestos fiber content in the New York laboratories of the Insulation Industry Hygiene Research Program.

Two scientist investigators, Dr. Harry Heimann and Mr. William B. Reitze, secured the samples during a recent two-week tour. They visited yards at Houston, Galveston, Beaumont, New Orleans, Pascagoula, Mobile, Jacksonville and Tampa.

They carefully inspected aircraft carriers, destroyers, Navy supply ships, container ships, and tankers.

Arrangements for the tour were made through the cooperation of the United States Department of Labor and the International Office of the International Association of Heat and Frost Insulators and Asbestos Workers.

Other Workers Endangered

The handling of asbestos insulation products presents a health hazard not only to the insulation workers but also (because of the confined areas) to the allied shipbuilding trade workers.

Dr. Heimann and Mr. Reitze found that the three most serious hazards appear to be

1. the extreme dustiness during removal of old insulation
2. an almost total lack of ventilation in confined spaces
3. the spread of dust from work areas into other regions of the ship.

Methods to remove old insulation with a minimum of dust production are receiving top priority consideration by Mount Sinai's engineers.

The design of a typical ship includes many small compartments

(Continued on last page)

Insulation Hygiene Progress Reports

Vol. 2, No. 2 Summer 1970

from the

Insulation Industry Hygiene Research Program

Editor: W. J. Nicholson, Ph.D., Published at the Environmental Sciences Laboratory (Irving J. Selikoff, M.D., Director), Mount Sinai School of Medicine of the City University of New York, New York, N.Y. 10029

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Fred L. Pundsack, Ph.D. Vice President, Research and Development, Johns-Manville Corporation, New York, N.Y.

George W. Wright, M.D. Director of Medical Research, St. Luke's Hospital, Cleveland, O.

PURPOSES OF THE INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM

1. To develop improved methods for minimizing exposure of insulation workers to dusts and fumes encountered in their work.

2. To disseminate knowledge of these improved methods of dust control wherever they may be applied advantageously and to offer cooperation, advice and assistance toward their universal adoption.

(l. to r.) New York's Mayor Lindsay, Commissioner of Air Resources Robert N. Rickles, and Environmental Protection Administrator Jerome Kretchmer discuss the new spray orders at City Hall.

NYC Leads USA—Sets Rules For Spray

(Continued from 1st page)

the World Trade Center engineers and their general contractor, Tishman Construction Company.

The interim orders will remain in force until adoption of final regulations following public hearings. The hearings are to be held within six weeks, according to Jerome Kretchmer, newly appointed New York City Environmental Protection Administrator. The new rules include requirements that

(a) any spray area be completely enclosed by tarpaulins,

(b) the area be vacuum-cleaned after application, and

(c) insulation in air circulation plenums or ducts containing asbestos be coated with a sealant to preclude erosion of asbestos-containing material into the air of the building.

(See page 3 for complete regulations.)

Some Contractors Made Effort

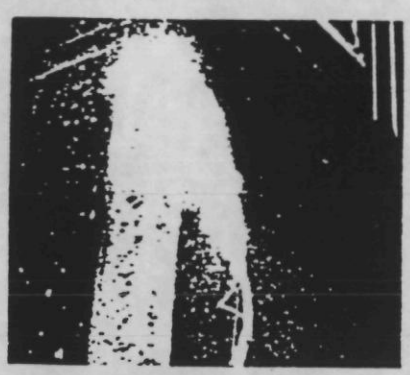
Dr. Robert N. Rickles, New York City's new Commissioner of Air Resources, emphasized the need for specific procedures that are enforceable and noted that voluntary measures to reduce environmental exposures were not uniformly followed.

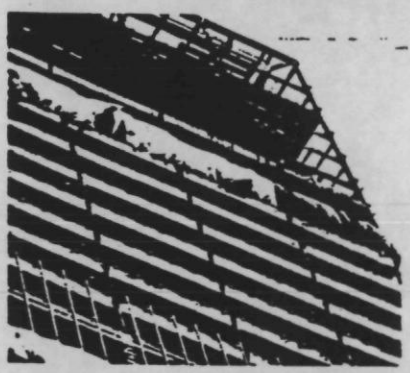
"Some contractors," he added, "made an effort to contain their spray operation." (See Spring 1970 issue of *Progress Reports* for story on World Trade Center.) "Other operators, however," he went on, "made only minimal efforts at containment. We also found that cleanup of waste was a serious problem everywhere, with workers of all trades being exposed continually to the debris of spray fireproofing insulation."

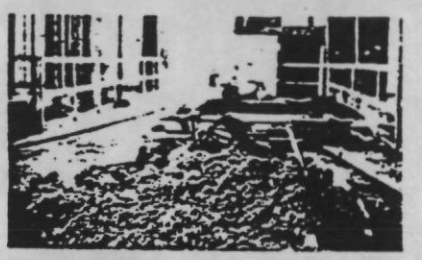
Dr. Irving J. Selikoff, IIHRP Director, endorsed the City regulations. "The technology for safe application of sprayed mineral fireproofing material exists," he said. "However, the utilization of appropriate containment and cleanup techniques must be uniform throughout the industry if we are to succeed in solving the health problem of mineral fibers in urban air.

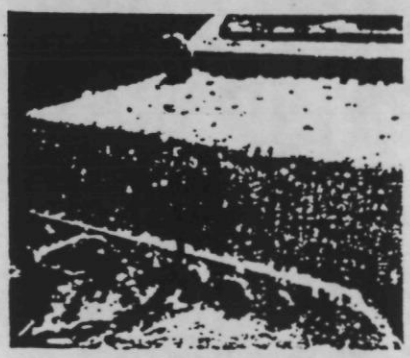
"It is of importance, too, to note the Environmental Protection Administration's concern with coatings of air plenums in buildings already in construction since it wishes to insure that air in ventilating systems not be contaminated by foreign material."

Text of the New Spray Rules:









Four examples of trade practices the new rules ban: (top to bottom) Spraying without any containment at all; Inadequate tarping; asbestos-containing debris uncleared up; and spray material that has been allowed to fall down on to construction equipment.

1. Before the start of spraying operations all floor areas shall be swept broom clean. Before the application of asbestos-containing material commences, the floor of the area shall be cleared of all objects, material and equipment other than that employed in the application of the asbestos-containing insulation or all objects, materials, etc. shall be covered with plastic or plastic-coated tarpaulins in a manner that precludes the subsequent dispersal of asbestos particulates.

2. The entire floor, or the part of the floor to be insulated, shall be enclosed with plastic or plastic-coated tarpaulins in a manner which shall preclude the escape of asbestos-containing material from the enclosure. All interior open areas, such as elevator shafts, stairwells, etc. shall be enclosed in a manner which shall prevent the escape of asbestos-containing material from the working area. "Stack effect" of the shafts, stairwells, etc., shall be considered in providing proper enclosures. An enclosure will be considered satisfactory only if visible insulating material cannot escape from the enclosure.

3. Wet asbestos-containing material which has fallen to the floor shall be immediately swept up and placed in a container having walls, bottom, and a tight cover strong enough to resist tearing or breaking under normal handling conditions and clearly marked as containing asbestos waste. The contents of the aforementioned containers shall not be transferred to another container, but the container shall be placed directly upon a vehicle for disposal at an approved site.

4. All floors will be vacuumed shortly after drying. The vacuum cleaner shall contain a strong, single-service, disposable inner bag of durable material which shall be removed from the vacuum cleaner and tightly sealed. The bag shall then be placed in a container of the type described in paragraph 3, which shall thereafter be placed on a vehicle for removal and disposal at an approved site.

5. The materials used to form the enclosure shall be thoroughly vacuumed upon completion of the application of the insulation in the area. The entire floor area, all ledges and surfaces including tarpaulins upon which waste insulation material may have fallen, shall then be vacuumed or revacuumed before removal of the enclosures.

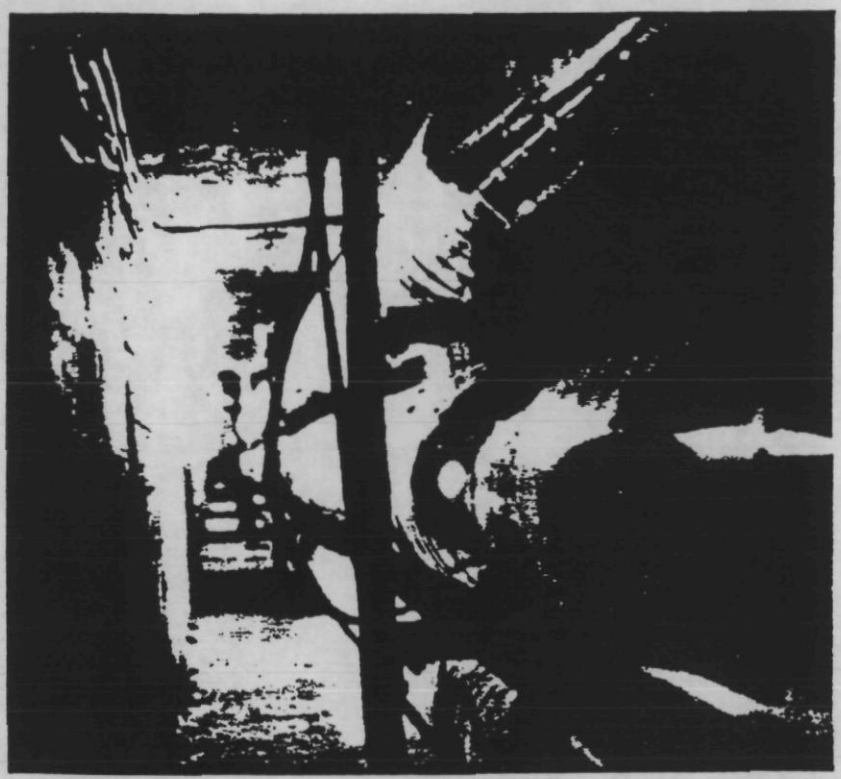
6. Enclosures shall not be dismantled until the area has been thoroughly vacuumed after completion of spraying and cleanup.

7. All areas used for opening bags containing asbestos insulating material and/or charging of hoppers shall be enclosed in such a manner that asbestos-containing insulating material shall not be permitted to escape from the immediate area in which such activity takes place.

8. Signs shall be posted outside enclosures warning persons of the hazard of entering the enclosure without appropriate mask and other apparel.

9. All persons involved in the spraying of asbestos at the site must be furnished with Bureau of Mines approved respirators for pneumoconionic-producing dust and must be furnished with suitable coveralls which will be left at the site and thereby preclude the removal of asbestos from the site. No person shall be permitted in an area in which asbestos spraying or handling has taken place until final vacuuming referred to in paragraph numbered "5" herein, unless such person is furnished with and wears a Bureau of Mines approved respirator for pneumoconionic-producing dust and coveralls of the type described herein. Facilities shall be provided and procedures instituted and supervised that preclude the removal and dispersal of asbestos-containing material from the construction site on the clothing or other appurtenances of persons leaving the area.

10. Any plenum or other structures coated with asbestos-containing insulation which is intended for use in the circulation of air in the building must be thoroughly cleaned of all debris and waste insulation. All applied asbestos-containing insulation within a plenum or duct must be coated with a sealant which precludes exposure of the asbestos-containing material to the circulating air.



Insulating pipes with asbestos-containing material in so confined a space as this adds to the danger of breathing the dust.

Confined Spaces Add Yet Another Danger

The Insulation Industry Hygiene Program has found answers to a number of problems in the asbestos insulation industry.

Coated calcium silicate pipe covering and block, plastic mixing bags, and proper use of dust collection devices are some of the solutions. All contain the dust at its source and all significantly reduce worker exposure to asbestos.

Portable Exhaust Systems

Some insulation work, however, presents problems not easily solved by containment at the source. Shipboard work, both application and tear out, and covering steam lines in confined tunnels are two such types of work.

When there is poor ventilation in such work areas, removal of dust is made difficult and temperatures may rise to much above 100° F. To these twin problems, two complementary solutions are now being studied by IIHRP engineers—the use of portable exhaust systems and self-contained air supply respirators.

Cool Air to the Face

In the confined space of a tunnel, the use of an exhaust system at a nearby manhole can reduce both the dust level and the working temperature. In many cases, easily obtainable and inexpensive exhaust systems of less than 5000 cubic feet per minute capacity would suffice. IIHRP engineers and industrial hygienists will be pleased to assist any contractor or union having specific problems associated with tunnel work.

Aboard ship, some use is made of portable low-volume exhaust systems, designed principally to control fumes from welding operations. These systems, however, are ineffective in changing the large volume of air in most ship compartments.

In some spaces having large volumes of air, exhaust systems of sufficient capacity to maintain clean air are either too costly or impractical to use. In these cases the solution may lie in self-contained battery-operated air supply respirators.

These respirators—far more comfortable to wear than standard ones—not only provide almost absolute respiratory protection from dust, but provide a cool stream of air to the worker's face. Batteries and motors have already been developed of sufficiently light weight as not to be objectionable. Several later models are under study by the IIHRP and full details and descriptions will be forthcoming in a future issue of *Insulation Hygiene Progress Reports.*

Shipyards Tour Shows Hazards

(Continued from 1st page)

with little natural ventilation. When the ship is in operation, the air in these compartments is changed by means of a forced ventilation system. But during construction or rebuilding, it remains stagnant. Fine dust and fibers put into the air by fitting and handling calcium silicate block or amosite blankets remain suspended for hours.

Special Techniques Needed

Dust generated by hand sawing or fitting asbestos block can easily fall two or three decks through gratings. The fibers thus deposited throughout an engine room may contaminate a ship for months. Here the use of drop cloths or boxes to contain the dust can improve conditions measurably.

Some of the methods being developed by the Insulation Industry Hygiene Research Program for controlling asbestos dust at land-based building construction sites can be used aboard ships. It is evident, however, that further special dust control techniques will have to be developed for the protection of all craftsmen in shipbuilding trades. Hence, the priority now being given to these problems by the IIHRP.

DEFENDANT'S EXHIBIT 1 Goodman 3/4/96 SR

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New Specifications Eliminate Asbestos From Trade Center

By GUY SAVINO
Evening News N.Y. Reporter

NEW YORK—A breakthrough in fireproofing skyscraper steel has been achieved by the Port of New York Authority at the World Trade Center, it was announced yesterday.

The authority said it will use a rockwool composition instead of asbestos, a substance which has come under attack because of the belief it causes lung cancer and other diseases.

The authority's announcement came as the city today completed the second of two hearings on a plan to ban the use of asbestos on buildings.

But even though the agency will use a different fireproofing substance, it already has used asbestos on the first 70 stories of the north tower of the trade center.

Although 40 more floors will be added to bring the tower to its full height of 110 stories, it already ranks among the 10 tallest buildings in the city.

There will be two such tower buildings. Construction on the the second has reached the 23rd floor. There are four other buildings in the complex.

Medical Opinion

The authority declared that rockwool will now be used on all the buildings instead of the asbestos.

The mineral, long used for insulation, is mixed with water and sprayed onto the steel structure to protect it from the effects of severe heat.

Medicial men said that research has shown that about 50 per cent of the men engaged in applying asbestos died of lung cancer.

The asbestos became a political issue because candidates charged that the authority was being permitted to pollute the environment with the asbesos dust. It was said the asbesios gets into the air and becomes a threat to the public.

According to a letter sent to Robert N. Ricdles, city air resources commissioner, Austin J. Tobin, the authority's executive director, declared the new substance to be used has a trade name, "Cafco."

It will cost the agency $110,000 and Alcoa, which is placing aluminum sheathing on the trade center towers, $175,000 to make the changeover, Tobin said.

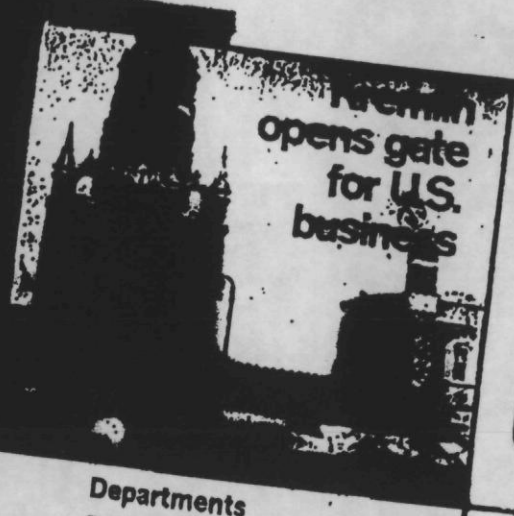
Tobin said long research led to the decision to use "Cafco." He said he is confident that the material will meet requirements of city health officials.

"I think," Tobin wrote to Ricdles, "you will agree that the anti-pollution procedures developed and instituted by the Port of New York Authority have been a landmark in construction techniques. In fact, our procedures were the basis for the rules and regulations governing asbestos spraying, which were ordered into effect by you as of May 13, 1970."

Tobin said in view of the fact the authority is a bi-state agency, its discussions with the city have been voluntary.

THE EVENING NEWS
Newark, N.J., Thursday, May 28, 1970

PLAINTIFF'S EXHIBIT PX-609



May 13, 1970 Vol. 106, No. 19

CHEMICAL WEEK

Departments

Business Newsletter 9
CW Business Index 19
Environment 49
International 41
International Newsletter 39
Marketing 37
Market Newsletter 33
Meetings 6
People 56
Production 38
Specialties 53
Stock Market Report 19
Technology Newsletter 47
Top of the News 12
Viewpoint 5
Washington Newsletter 23

Coming in CW

Achema '70 preview. How to make the best of your visit to Frankfurt, Germany, for the world's biggest chemical industry show. CW, May 20

What's ahead for propylene? Petrochemical producers and oil refiners vie for this basic chemical, boost its value. CW Report, May 20

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VIEWPOINT

5 A slate of scientific breakthroughs and a crisis for society.

TOP OF THE NEWS

12 Here's where they stand—CW's ranking of chemical companies.
14 Industry draws battle plans for new international trade hearings.
15 Chevron charged with contributing to Gulf of Mexico oil spills.
15 Dow's Doan places company's environment cards on the table.
16 Strike casts shadow in otherwise bright outlook for rubber makers.
17 Office of Emergency Preparedness predicts summer power failures.
17 Did government study spark new round of copper expansions?
18 Army ready to move nerve gases from Okinawa to Oregon.

TECHNOLOGY

38 Survey shows maintenance managers need more staff backup.

MARKETING

37 To CMRA members, key issue is raising expansion money.
37 New corrosion-resistant liners for steel drums make their bow.
37 Water-resistant plastic containers save weight for shippers.

INTERNATIONAL

41 Soviets seek U.S. technology; U.S. chemical makers eye market.

ENVIRONMENT

49 Resin-based mastic is tested for fireproofing structural steel.

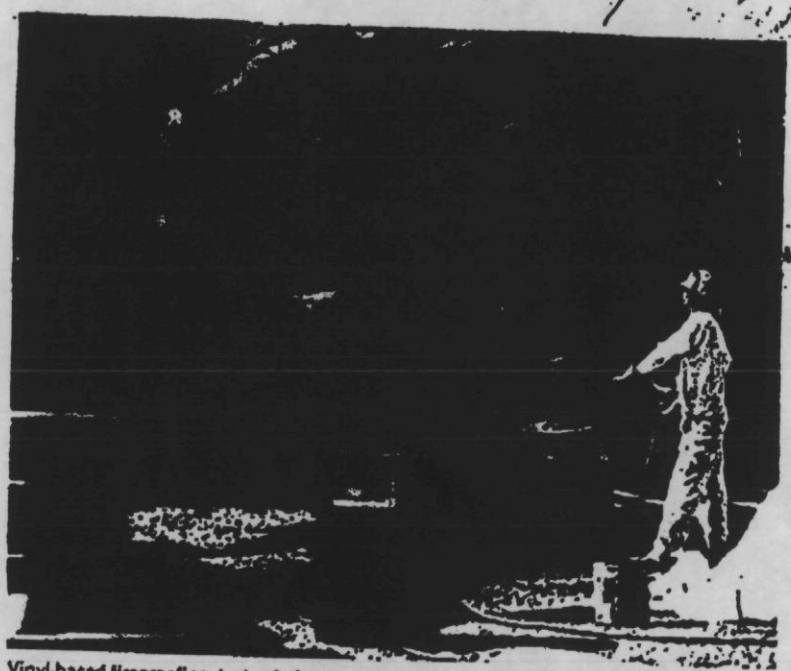
SPECIALTIES

53 USDA meeting highlights durable-press finishes for knit goods.

PEOPLE

56 McKesson's Gafney: counting on computers for help in hiking sales.

PLAINTIFF'S EXHIBIT



Vinyl-based fireproofing, instead of ordinary asbestos mixture, is sprayed on steel beams.

Trying a costlier coating

Antipollution rules can make high-priced products economic. Latest instance: plastic-based mastics for fireproofing steel

If a certain resin-based mastic passes its tests this week, it may be used instead of the conventional asbestos-containing mixture as the fireproof coating on all structural steel in the world's tallest office buildings—the two 110-story towers of New York's World Trade Center.

This proposed change in materials, which could cost the contractor an estimated $1 million or more, is being considered because of a tightening of New York City regulations on the spraying of materials containing asbestos.

Under the new controls, issued last month by the city's Dept of Air Resources, the contractor must (1) completely enclose the area where the asbestos is being sprayed, and (2) furnish protective apparatus for workers.

Altering the Economics: This—like the detergent industry's '63-'64 shift to biodegradable surface-active agents, and the current campaign to ban the use of lead additives in gasoline—is yet another example of how environmental policy can affect the markets for chemical materials.

In this case it appears that mastic coatings based on synthetic resins—even though their price per pound may be five times greater than that of the asbestos mixture—could win a substantial share of the market for fireproofing structural steel. Ultimately, other markets for asbestos could be affected. Pending in the California legislature is a bill to prohibit the use of asbestos insulation in some air-duct systems.

For some years medical researchers have been investigating the effects of asbestos particles inhaled into the lungs. New York's latest action apparently reflects increased concern about such effects. It's estimated that of the 200 tons of asbestos mixture used in spray coating the steel in a 30-story building, as much as 50% can blow into the streets.

Robert Rickles, New York's new commissioner of air resources, followed up the revision of the regulations by issuing show-cause orders at several major high-rise construction sites. These orders, he says, were "predicated on information received by me to the effect that exposure to asbestos particulates may result in lung cancer, mesothelioma and cancer of the peritoneum."

(Johns-Manville Corp., a leading producer of asbestos, says it has seen no evidence that there is any hazard to the general public from occasional, brief exposure to asbestos dust. Nevertheless, J-M continues, it is cooperating in efforts to reduce or eliminate the amount of asbestos that escapes into the air at construction sites.)

Competing on Performance: It's clear that on a price-per-pound basis, resin-based mastics can't compete against the conventional mixture of asbestos, rock wool and cement. Estimated costs of materials required to give two-hour fire protection for 1 sq.ft. of steel under standard conditions: asbestos mixture, 15-50¢; mastic, 80¢-$1.50. But the mastic contains no asbestos, it can be sprayed or applied with brush or roller, and, unlike asbestos, it's deemed suitable for exposed surfaces.

U.S. Mineral Co. (Stanhope, N.J.) declines to give any particulars for its Cafco Blaze Shield Type DC/F, the plastic-based mastic being considered for use on the World Trade Center steel. Albi Mfg. Co. (Rockville, Conn.), subsidiary of Cities Service Co., says its Albi-Clad mastic is a ceramic-filled vinyl material. Albi's product has already been used to cover exposed steel members at several chemical plants in Canada. The company says it should be applied in thickness of 3/8-7/16in. after the steel has been given a phenolic or chromate primer coat.

Still another fireproofing system is being used in the 64-story U.S. Steel Building under construction in Pittsburgh. Hollow, exposed columns, extending from ground level to the top of the building are to be filled with a heat-absorbing solution of water and ethylene glycol.

END

Pollution Conference

McGraw-Hill Publications Co. will sponsor a conference on "Industry and the Environment," June 16-18, in the Americana Hotel, New York. Hundreds of industrial managers are expected to attend the program that will bring together major authorities in a variety of fields to discuss all important aspects of industry's relationship to pollution control. Fee: $395.

ENGINEERING NEWS RECORD

May 7, 1970

Sprayed-asbestos fireproofing work halted

[illegible]-asbestos fireproofing oper- [illegible] on steel-framed buildings halted [illegible] in New York City. The stop- [illegible] resulted from regulations written [illegible] medical research showed that as- [illegible] fibers can cause cancer of the [illegible] and gastro-intestinal tracts [illegible] (ENR 4/2 p. 11).

New York City's Department of Air [illegible] prepared the regulations and [illegible] into effect three weeks ago. [illegible] week, inspectors issued summonses [illegible] that the fireproofing subcon- [illegible] on three building projects were [illegible] of the regulations. The as- [illegible] spray contractor on a fourth [illegible] voluntarily halted work. City [illegible] report that the four buildings [illegible] only jobs in the city where fire- [illegible] operations have been under [illegible].

Continued violations could result in departmental hearings leading to the sealing of asbestos-spraying machinery by the city.

The four projects are one of the two 110-story towers of the World Trade Center, the 54-story Standard Oil (N.J.) building near Rockefeller Center, a 40-story building at 2 New York Plaza in the financial district, and a 37-story structure in midtown Manhattan.

Ironically, the World Trade Center project was the first and only building in the city where the spray contractor had taken precautions to prevent scattering of dried asbestos. The owner, the Port of New York Authority, cooperated with the city months ago as a result of the medical studies conducted by a team of physicians.

The building's exterior on the floors where asbestos was being sprayed was tightly enclosed by tarpaulins and the asbestos-spray work area was sealed off from other interior sections. The job, however, lacked the vacuum cleaning operation as required by the regulations, according to a Port Authority official.

Empire Pyro Spray Inc., New York City, asbestos-spray subcontractor on the New York Plaza building, was summoned to a hearing by Robert N. Rickles, commissioner of the Department of Air Resources. Although the company has stopped work, the hearing was called after the company failed to guarantee it would comply fully with the regulations in the future, according to department officials. This move could lead to the first court test of the regulation.

PLAINTIFF'S EXHIBIT
PX-598

water rushing into the resultant crater spread it smoothly over the bottom.

ventionally, financing it with savings in explosives. Only half the expected

so, technical costs accounted for 60% of the total.

Sprayed-asbestos fireproofing work halted

Sprayed-asbestos fireproofing operations on steel-framed buildings halted last week in New York City. The stoppage resulted from regulations written after medical research showed that asbestos fibers can cause cancer of the pulmonary and gastro-intestinal tracts if ingested (ENR 4/2 p. 11).

New York City's Department of Air Resources prepared the regulations and put them into effect three weeks ago. Last week, inspectors issued summonses alleging that the fireproofing subcontractors on three building projects were in violation of the regulations. The asbestos-spray contractor on a fourth building voluntarily halted work. City officials report that the four buildings are the only jobs in the city where fireproofing operations have been under way.

Continued violations could result in departmental hearings leading to the sealing of asbestos-spraying machinery by the city.

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PLAINTIFF'S EXHIBIT MP17.3

DAILY NEWS, WEDNESDAY, APRIL 22, 1970

City Slaps Builders Who Spray Asbestos

The city moved again yesterday to put the heat on asbestos pollution, serving show-cause orders at construction sites at 2 New York Plaza at South and Broad Sts., and 866 Seventh Ave.

The orders require the contractors to show cause within five days why their asbestos spraying equipment should not be sealed. The action followed the activation on April 13 by Air Resources Commissioner Robert N. Rickles of the nation's first regulations controlling asbestos pollution.

The commission hit the huge World Trade Center with a similar order last Friday. The regulations deal with handling and cleanup procedures in the use of asbestos. Asbestos pollution, the Air Resources Department says, may cause lung and other cancers.

PLAINTIFF'S EXHIBIT PX-587

PLAINTIFF'S EXHIBIT MP17.2

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Page 63
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THE NEW YORK TIMES, MONDAY, APRIL 20, 1970

BUILDERS WARNED ON ASBESTOS RULES

The City's Environmental Protection Administration said yesterday that contractors at many construction sites were not obeying the new regulations requiring the containment of asbestos dust and that it would order work halted on projects that did not comply.

Speaking on the WABC-TV program "Eyewitness News Conference," Commissioner Jerome Kretchmer said his agency had the power to shut down violators of the regulations which went into effect last Monday. The new head of the agency's Air Resources Department, Robert Rickles, said later that at least one company had been ordered to a hearing in his office next Friday to determine whether it is a violator. If so, Mr. Rickles said, equipment at the construction site will be sealed.

Earlier, on the WNBC-TV program "Man In Office," Mr. Rickles said equipment of companies that violated other air pollution rules would be shut down if they did not submit a compliance schedule after receiving three or more summonses. He also announced plans to concentrate the department's 86 inspectors in specific areas for several weeks at a time, beginning Wednesday, Earth Day.

Declaring the citys' air "disgusting" and "unfit for human consumption," he called for stiffer regulations, speedier prosecution, much higher penalties—up to $10,000 a day, and better utilization of manpower.

PLAINTIFF'S EXHIBIT PX-581

The Evening Star
Real Estate
WASHINGTON, D. C., FRIDAY, APRIL 17, 1970

REAL ESTATE TODAY

Trade Towers Alter Shape of Manhattan

By DANIEL POOLE

NEW YORK — If you stand atop the Empire State Building and look south toward the Statue of Liberty, you can see the world's tallest buildings rising on the lower Manhattan skyline.

They are the twin towers of the World Trade Center, and each will soar 110 stories above nearby Wall Street — dwarfing the other skyscrapers that have made the island's southern tip so famous.

The two massive towers will be only 100 feet higher than the 102-floor Empire State Building. But each will contain 4.5 million square feet of office space — more than twice the amount in the present tallest building in the world.

The time element of the gigantic construction project, however, cannot compete with that of the Empire State Building, which was built 39 years ago in the incredibly short span of 14 months. It cost $25 million, a depression-era bargain.

Construction work on the $600 million World Trade Center project began in late 1966, and the first tenants are scheduled to move in by the end of this year. The entire project is scheduled for completion by late 1973 — a total of seven years.

Already 90 percent rented, the Trade Center will be occupied principally by international importers and exporters, and it will serve as a sort of private United Nations for world commerce.

Most of the tenants, both American and foreign, will occupy relatively small office spaces. But one large tenant, the State of New York, will take 1.8 million square feet — about the size of the entire Empire State Building.

THE WORLD TRADE CENTER is being built by the Port of New York Authority on a 16-acre site bounded by Barclay and Vesey Streets on the north, Church Street on the east, Liberty Street on the south, and the West Side Highway and Hudson River on the west.

Besides the two towers, it will have four eight-story buildings — two plaza office buildings, a 600-room hotel and information center and a United States Customs building. They will surround a five-acre landscaped plaza, beneath which will be a railroad terminal, a shopping concourse and parking garages for 2,000 cars.

The twin towers, faced with a shiny aluminum skin, will have clean, uninterrupted lines from top to bottom. They were designed by Minoru Yamasaki & Associates of Troy, Mich., and Emery Roth & Sons of New York.

Each tower will be divided into three elevator zones, with lobbies at ground level, one-third of the way up and two-thirds of the way up. Thus express elevator service can be provided to either skylobby, with local service to specific floors in each zone.

This zoned elevator system will cut down on the number of shafts needed, since local elevators for floors 1 to 43 can use the same shafts as those for floors 45 to 77 and for floors 79 to 110. Express elevators will stop only at floors 1, 44 and 78.

Even with such space economies, each tower will have 99 elevators to serve the 25,000 employes and 40,000 visitors who will enter each building daily. And there will be special elevators to serve the observation deck atop one tower and the restaurant atop the other.

•

TO BUILD THE TOWERS, the port authority acquired a total of 13 blocks on Manhattan's lower west side. Most of the buildings were outdated, and 60 percent were more than 100 years old. They had been built on fill land reclaimed over the years from the Hudson River.

Engineers realized they had to come up with some new ideas, since the site was spongy and bedrock was 70 feet beneath the fill and the old riverbed. What they did was create a huge bathtub within which to build the structures.

This was done by digging a trench around the entire area, down to solid rock. As the trench was dug, it was filled with clay slurry to hold the water out. Next, concrete was piped to the bottom, forcing out the slurry. Excavation then proceeded within this $8 million perimeter wall.

What do you do with 1.2 million cubic yards of debris when you dig out a seven-story basement over a 13-block area? Hauling it would be prohibitive. The port authority's answer was to build a steel cofferdam next to its site on the Hudson River and fill it in. This created 23 acres of new land—a gift to New York City worth about $90 million.

Another problem is that transmissions from the world's highest television tower atop the Empire State Building will bounce off the World Trade Center buildings and create problems for viewers in some parts of the metropolitan area.

The solution: Move the television tower to the top of one of the World Trade Center buildings and pay the Empire State Building's owners for 10 years worth of lost revenue. This will change the appearance of both buildings, of course, and nobody is happy about it.

But that change will be negligible compared with the appearance of the two new tallest buildings in the world on the ever changing skyline of New York City.

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PX-579

PLAINTIFF'S EXHIBIT PX-575

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the village VOICE

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THE WEEKLY NEWSPAPER OF NEW YORK

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Vol. XV, No. 16 ● New York, N. Y. ● Thursday, April 16, 1970

BELOW WASHINGTON SQUARE. Ten downtown artists exhibit their works in their own studios each weekend during April. Among them are Alan Kessler (above), Paul Spina (left), and May Stevens.

Voice: Fred W. McDarrah

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.. the spirit of holy anarchy at that moment—breathing a the Guardian's"—Richard Goldstein

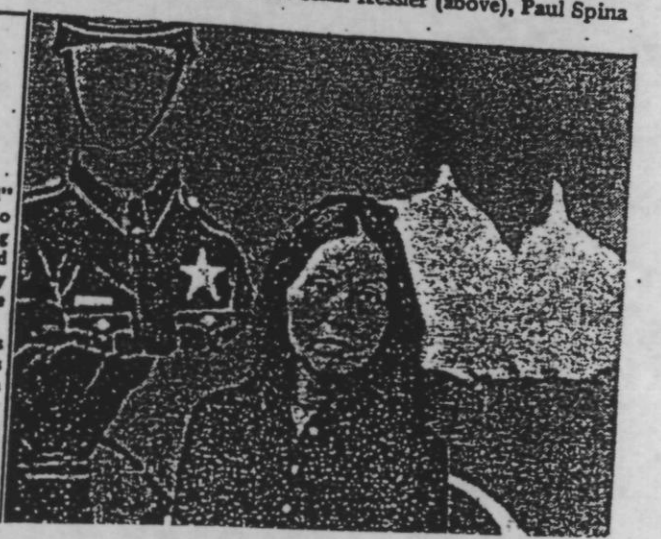
operated by the workers themselves.

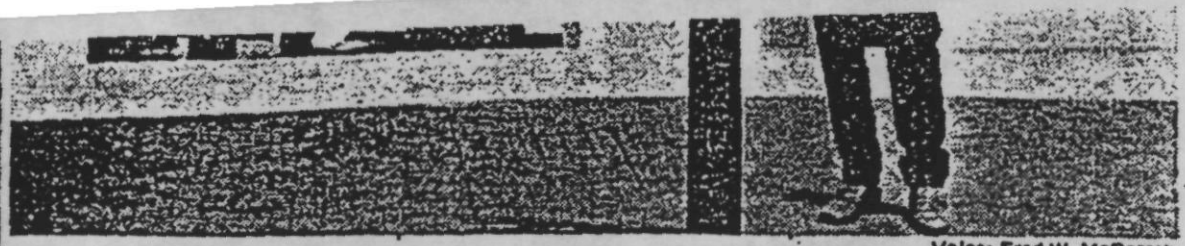
The picket lines went up last Thursday and by Friday morning the strikers were making headway.

Asbestos Spray: 'Deadly'?

Asbestos, the "magic mineral" used in vast quantities to fireproof skyscrapers, is being linked to deadly lung diseases and cancer, and a major controversy is erupting over its use at the World Trade Center.

About 5000 tons of asbestos will be sprayed onto steel beams at the Trade Center, and an incalculable amount of that spray will escape into the air. Asbestos particles are virtually indestructible, and readings have been planned for as far away as Boston. Asbestos particles also





Voice: Fred W. McDarran

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Continued on page 36

Asbestos Spray: 'Deadly'?

Asbestos, the "magic mineral" used in vast quantities to fireproof skyscrapers, is being linked to deadly lung diseases and cancer, and a major controversy is erupting over its use at the World Trade Center.

About 5000 tons of asbestos will be sprayed onto steel beams at the Trade Center, and an incalculable amount of that spray will escape into the air. Asbestos particles are virtually indestructible, and readings have been planned for as far away as Boston. Asbestos particles also escape from waste materials and from demolition of buildings in which asbestos was used. Last week, pedestrians along Sixth Avenue around 50th Street complained of a "white shower" of construction material that turned out to contain asbestos.

While precautionary measures at the Trade Center exceed most other construction sites in the city, the Trade Center poses a significant danger because of its location, its height, and the massive amounts of asbestos used in heat insulation. Monday, the city's Air Resources Commissioner, Robert N. Rickles, announced a packet of regulations aimed at decreasing the safety hazards of asbestos spraying. These included better insulation, disposal of wastes, and

Continued on page 20

Newark: First Real Test Of the New Black Politics

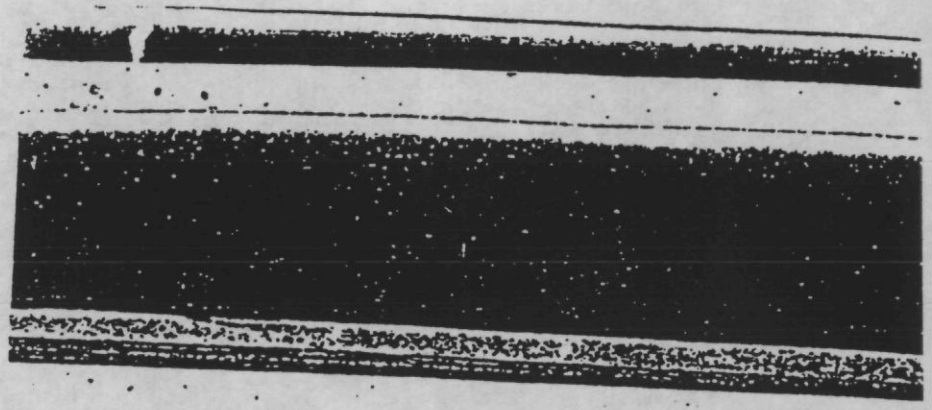
by Ron Rosenbaum

". . . Newark always had a bad reputation. I mean everybody could pop their fingers. Was hip. Had walks. Knew all about The Apple."

—Le Roi Jones, 1965

NEWARK—Last fall some bright talent in the Lindsay campaign decided that a very intelligent way of making voters appreciate New York City would be to show them films of Newark and play sad music in the background. So there were 60-second spots with post-riot footage of Springfield Avenue with its blocks and blocks of.

Continued on page 46



Asbestos Spray: 'Deadly'?

Continued from page 1

better protection of sprayed areas. Workers are required to wear special overalls and respirators. Rickles said the new regulations were an "interim measure" until public hearings could held on the health hazard, probably in about six weeks.

A number of groups and individuals, however—among them Citizens for Clean Air and tenants at Westbeth (the West Village artists' housing project)—are not satisfied with the city's stopgap protections. They protest that even the smallest amount of asbestos in the air is a lethal risk, to workers and to the community, and that as long as asbestos is sprayed, up to two-thirds of the sprayed particles will escape into the air. At the Monday Press conference, Mary Kahn of Citizens for Clean Air asked Rickles why asbestos substitutes were not being used, some of which had been shown to contain only a minimal amount of asbestos. Rickles said he did not wish to interfere in the private matters of the construction industry. He also said that painting asbestos instead of spraying would reduce the danger but increase costs.

Neither asbestos nor its dangers is especially new. But only recently has evidence begun pouring in that has established asbestos as a killer. In 1962, three physicians compiled a list of 632 industrial workers exposed to asbestos since 1942. By 1962, 262 of the group had died, although the normal death rate should have been 203. Moreover, 45 died of lung cancer, when actuarial tables predicted only six. And another 50 deaths resulted from other types of cancer. Be
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DEFENDANT'S EXHIBIT
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3/4/96 SR

Dust Peril At Trade Center?

By TIMOTHY FERRIS

That white coating covering the bottom third of one World Trade Center tower like cake icing is asbestos. Eventually both towers are to be completely sheathed in asbestos spraay, and there is mounting concern about whether the spraying poses a hazard to breathing human beings.

The Trade Center is the biggest, though not the only, project in the city where asbestos is being sprayed. City personnel equipped with vacuum cleaners and filter [illegible] ave been gathering air samples in the area, and politicians exploring the pollution issue have begun to make it a campaign stop.

Robert Morgenthau, who is a candidate for the Democratic gubernatorial nomination, held a news conference in a drizzling rain at the trade center construction site yesterday to charge that Governor Rockefeller has done nothing to determine whether those who work or live in downtown Manhattan were endangered by dust from the spraying, which many doctors believe causes lung cancer. Yellow and white tarpaulins, erected to contain the spray, billowed from the middle floors of the tower.

"The cancer rate for asbestos workers is seven times the national average," Morgenthau said," and 5000 tons of asbestos will be used in this project.

"One thing about asbestos—it is indestructable," he said. "Once it gets in a person's system it never gets out." Morgenthau called on the state Air Pollution Control Board to hold hearings "to determine the exact health effects of massive amounts of asbestos spray which may produce cancer now being injected into the atmosphere."

Await Bid

Alexander Rihm, executive secretary of the board, said no action would be taken until they received a formal request from Morgenthau.

The Port Authority issued a statement defending their safety precautions as "quite superior to others in use elsewhere." They said the tarpaulins contain the spray, and that excess spray is collected while still wet and packed in plastic bags or metal containers so that the wind won't blow it away when it dries.

"It is quite true that they have done more than anyone else," said William Nicholson, assistant professor of community medicine at Mt. Sinai hospital, "but there are things they could do that would improve matters. They are like two-thirds of the way there."

Mt. Sinai plans to use a 40,000 power electron microscope to analyze air samples taken by the city at eight locations around the trade center site. Analysis will take about two weeks, Nicholson said.

NEW YORK POST, WEDNESDAY, APRIL 15, 1970

PLAINTIFF'S EXHIBIT
PX-573
1-23-97

T-WTC - Construction Fireproofing (P)

PLAINTIFF'S EXHIBIT PX-561

Loose asbestos fiber seen as cancer threat to men in building trades

889-15

Medical researchers have found strong evidence that sprayed asbestos used in fireproofing steel-framed buildings causes cancer in men who work on these buildings.

The hazards of asbestos are becoming a public issue. New York City is considering regulating its use and a California legislator introduced a bill this year to prohibit installation of asbestos inside air duct systems in public buildings. So far, however, no positive legislative action to control its use or method of application has been enacted.

The most likely victims are the men who spray the asbestos mixture on exposed steel members and ductwork and apparently inhaled the heaviest amounts of asbestos fiber.

Once asbestos fibers enter the pulmonary or gastro-intestinal tract, they never leave the body, never break down. Medical research is making an increasingly strong case against these fibers as a source of cancer.

The asbestos fibers and dust particles, those highly visible during a spraying operation and the millions of microscopic ones, also cause asbestosis, which is associated with lung cancer.

Three physicians have statistically tied asbestos to cancer among workers in or closely allied to the building trades. They are: Dr. Irving J. Selikoff, director of the Division of Environmental Medicine at Mt. Sinai Hospital, in New York City; Dr. Jacob Churg, chief pathologist at Barnert Memorial Hospital of Paterson, N.J.; and Dr. E. Cuyler Hammond, vice president for epidemiology and statistics of the American Cancer Society.

In 1962 they compiled a list of 632 men who, as of Dec. 31, 1942, had been members of two metropolitan New York City locals of the International Association of Heat and Frost Insulators and Asbestos Workers (IAHFAW), AFL-CIO, and who had been exposed to asbestos for 20 years or more. Union, medical and insurance records showed that in the 1932-1962 period, 262 out of the 632 had died, seven before 20 years of exposure. On the basis of ages of the study group, the normal death total should have been 203.

Moreover, 45 died of lung cancer, when actuarial tables anticipated only six. And another 50 deaths resulted from other types of cancer. Of this number, 29 died of gastro-intestinal cancer, although only 10 would have been the normal number for this disease.

Still working with the original list, Dr. Selikoff later found that between January, 1963, and March, 1968, of the 370 survivors of the original 632 men, 113 more had died, while standard mortality tables would predict only 50 deaths. Of the 113 deaths, 28 were caused by cancer in the pulmonary tract, eight by gastro-intestinal cancers and 15 from asbestosis, which is a build-up of scar tissue in the lungs resulting from the presence of asbestos particles.

The scarring impairs the lungs so severely that they cannot absorb sufficient oxygen. There is no cure. Death, a strangulating, coughing demise, is the only end.

Dr. Selikoff says that products in which asbestos has been bonded into the material, such as floor and ceiling tiles, roofing, siding and pipe, are not considered a cause of cancer.

The data that scares. The data disclosed by Dr. Selikoff pushed the New York City Department of Air Resources into a start on writing regulations that would regulate the spray application of asbestos for both fireproofing and insulation.

The regulations would require: Before insulating and fireproofing material is applied, the entire floor of the area involved in the operation be cleared of all objects, materials and equipment except that needed to apply the material.

- As the material falls to the floor, fragments be swept up immediately and placed in special containers.
- Wet sweeping of the area, and vacuuming to pick up the material that had dried.
- Enclosure tarpaulins not be dismantled for 24 hours after completion of clean-up unless adequate mechanical means are provided to clean the air within the enclosed area.

Great Britain already has strict regulation of sprayed asbestos fireproofing (see box).

Richard L. Ottinger, a Democratic member of the House of Representatives from Westchester County, N.Y., last week latched on to the sprayed-asbestos operation as an environmental issue with political appeal.

Ottinger, a cosponsor of the federal Air Quality Act of 1967, charges that New Yorkers are exposed to tons of cancer-causing asbestos dust every year. He specifically cites the sprayed-asbestos method of fireproofing buildings and demands that the federal government impose regulations governing the use of asbestos.

He says the federal Air Pollution Control Administration can act now under authority already provided by the Air Quality Act.

The apparent virulence of asbestos is more than a table of death rates to Ottinger. Five years ago it struck at Mike Kitzmiller, now Ottinger's legislative aide. When Kitzmiller was making repairs on his house, some loose asbestos insulation fell into an open cut on his shoulder.

The cut healed, but one year later the scar developed a "mean-looking dark area around it," according to Kitzmiller. By last summer, the scar became painful. Tests showed it was malignant. Surgery removed the cancer.

Hitting the obvious. Ottinger, now seeking the Democratic nomination for U.S. senator from New York, was calling attention to a phenomenon seen by

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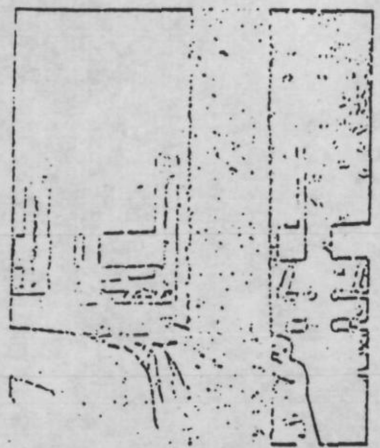
many persons in cities across the country, but understood by a relatively small number. From buildings under construction there is often a gentle floating fall of a cottony material. This is material that fails to adhere to the steel as it should and blows up, down, around and across a job and sometimes over wide sections of a city on windy days.

The fireproofing material is a mixture of asbestos, rock wool and cement. It is contained on the job in a cone-shaped hopper equipped with a worm gear at the bottom that feeds the mix into a hose. Compressed air, at about 22 psi, pushes it through the hose to a nozzle. Approximately 1 in. beyond the nozzle's end, the dry asbestos-rock wool-cement mix interacts with a stream of water running through a second hose.

The wet fireproofing material then is sprayed directly against the steel members previously hosed down with water to improve bonding.

About 200 tons of sprayed fiber material is used on a 30-story building. Depending on weather conditions and measures taken to provide some enclosure, as much as 50% of the sprayed material may be wasted.

The resulting storm of asbestos dust is a potential danger to everyone on the job, according to Dr. Selikoff. He has not as yet gathered extensive data on the threat to the general public and will not guess the possible incidence of asbestosis or lung cancer among those not directly working with asbestos but intermittently exposed to it in a casual way.



Asbestos airborne is source of worry.

The helping hands. Dr. Selikoff has received support from the insulators and asbestos workers international union since mid-1950. The union first provided the health histories of its members. Then in October, 1968, Johns-Manville Corp., of New York City, the largest producer of asbestos in this country, joined with the international union in backing Dr. Selikoff's work with cash. The company and the union provided $362,500 to finance a new program called the Insulation Industry Hygiene Research Program (IIHRP). Dr. Selikoff directs the program out of Mt. Sinai Hospital.

IIHRP's primary purpose is to develop methods of minimizing exposure of all insulation workers to dust and fumes encountered on the job.

The program has already had some repercussions. Chief among them is the sprayed asbestos fireproofing operation at the twin 110-story towers of the World Trade Center in New York City. On this job, which will require an estimated 5,000 tons of sprayed fireproofing, specially designed tarpaulins cover the exterior of the floors being fireproofed. The tarps extend through the window openings and are tucked back under the sprandrels so that material being sprayed will not escape from the area and fall on other floors, or surrounding streets. Moreover, the area being sprayed is closed off inside the building with plastic sheeting so that the materials will not drift into adjacent work areas.

New York City has also taken an initial step by preparing rules to control the application of sprayed-asbestos fireproofing. But the regulations have not gone much further than an initial draft since the city's Environmental Protection Administration and the Department of Air Resources have not had commissioners at the helm for several weeks. The rules, therefore, have not been pushed.

As proposed the regulations would require that sprayed asbestos fireproofing contractors obtain a license. In addition, the area of a building being sprayed would be tightly sealed, the precautions approximating, and in some cases, exceeding those now in effect at the $600-million World Trade Center project.

Should such regulations ever become effective, they would raise costs of fireproofing with sprayed asbestos. A structural engineer reports the costs now range between 30 cents and 60 cents a sq ft.

And another broad estimate came from Mario & DiBonno Plastering Co., Inc., of Great Neck, N.Y., which said the approximate cost of fireproofing a 30-story building is $250,000.

One of the five major companies that make the spray-asbestos material has sought and succeeded in developing a spray-on fireproofing compound that contains no asbestos. The manufacturer, U.S. Mineral Products Co., of Stanhope, N.J., said that the new product, Cafco Type D-C/F, will be on the market in about a month.

It contains mineral wool and proprietary binders it will not identify. It will cost about 10% more than spray-on asbestos fireproofing material.

Company officials say that they developed the new material because of the controversy starting to develop over asbestos.

Engineering News-Record
April 2, 1970

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TO FILL YOU IN

The cover article on the link between lung cancer and sprayed asbestos started out as a story on what's new in building demolition work.

Assistant editor Michael Fallon went to the New York City Department of Air Resources to find out if demolition contractors had to comply with any dust pollution standards. He learned not only that they do, but that the department is drafting regulations governing sprayed asbestos. From then on, he was after a different article.

Michael Fallon

Fallon was an architectural reporter for the F.W. Dodge Division of McGraw-Hill Information Systems Co. before he joined ENR's Buildings Department in January. He found that researching the asbestos-cancer article frequently took him far from the construction field, into hospitals, medical laboratories and public health agencies.

"One thing particularly impressed me on this assignment," says Fallon. "It was that a major asbestos producer, the asbestos workers union and some asbestos products manufacturers were concerned enough about the problems to cooperate with medical researchers to try to make working with and around asbestos a safer proposition.

"This one fact would have been enough to convince me that here was a health hazard in need of some practical solutions and public attention."

For probably the first time in its 96 years of covering construction, ENR has a physician on the cover. Harry Jensen, ENR's art director, wanted a lung X-ray for the cover and went to the McGraw-Hill, Inc., Medical Department for help. Eli Stern, M.D., staff physician, lent us a shot of his own chest.

EUGENE E. WEYENETH, *Publisher*

Engineering News-Record
4/2/70

DECEMBER 1968

ach(6)v

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achv
VOLUME 65, NUMBER 12

Spray applied mineral fiber fireproofing material meets GSA specification on dusting.

Fireproofing Return Air Plenums

MICHAEL J. KODARAS, President
Kodaras Acoustical Laboratories, Elmhurst, N. Y.

IN OFFICE buildings the space between the underside of the steel floor deck and the hung ceiling is frequently used for return air plenums. A large proportion of these steel decks are fireproofed in conformance with local and national building codes with products manufactured by member companies of Sprayed Mineral Fiber Manufacturers Association.

Mineral fiber fireproofing material is a blend of asbestos and mineral fibers mixed with inorganic binders. The spray is applied to steel decks, columns and girders. See Fig. 1.

As the plenum is used to guide air back to a central point, it is essentially a large duct. Thus, the Association became concerned over the possibility that the airflow could dislodge the sprayed mineral fiber or cause it to dust in the plenum with the following possible results:

- Removal of sufficient fireproofing material to cause reduction in rated fire protection.
- Filters becoming clogged and contaminated return air being recirculated to the supply system.
- Clogging of supply air orifices in pressurized plenum ventilating ceiling systems.

In cooperation with General Services Administration (GSA), the Association arrived at a specification for a testing procedure.[1] A portion of the specification on dusting reads:

"5.1.6.1: Test shall be made in a suitable tight metal duct with a filter at the blower end having an efficiency of 95% in filtering particles of 5 micron size or larger. A dust collecting black cloth over the other open end shall be made of nylon fabric having a thread comb per inch of 102 for warp and 82.3 for filling, and calculated deneir of 30 for both warp and filling. The cloth shall be dried to constant weight at 120F before each weighing. Specimen of the specified minimum density for the type of material proposed for use shall be placed in opening in side of duct so that face of sample and inside face of duct are in the same plane. Air velocity shall be parallel to the face of sample and maintained at a minimum of 800 fpm as determined by a standard vane type anemometer. Specimen shall have a minimum surface area of 4 sq ft and a minimum thickness of ¾ in. of sprayed material. The specimen shall be purged for six hours, after which it shall be tested for 24 hours. Gain in weight of the black filter cloth or air erosion for this test period shall not exceed 0.025 grams per sq ft."

In order to develop this testing procedure, the Association commissioned Kodaras Acoustical Laboratories to design and build the test apparatus. In addition, the laboratory was to arrive at a method of weighing the dusting such that the measurement would not be affected by nonsprayed

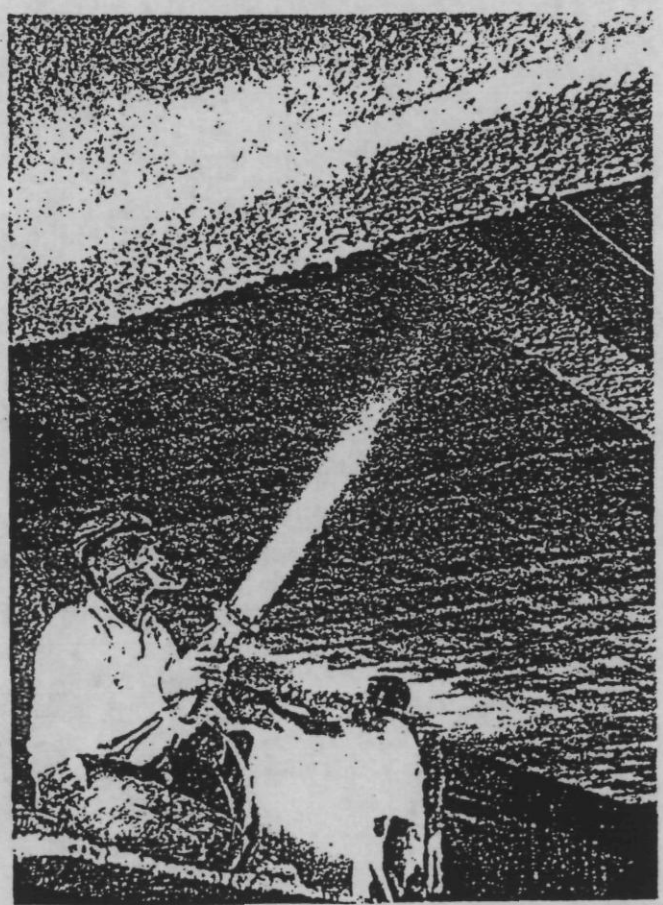

Fig. 1. Mineral fiber fireproofing material is spray applied to steel decks, columns and girders.

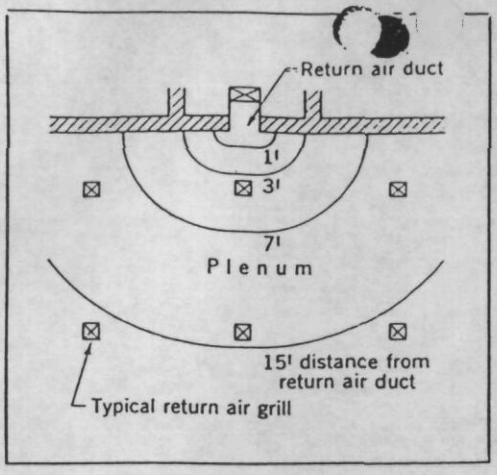

Fig. 2. Typical return air plenum.

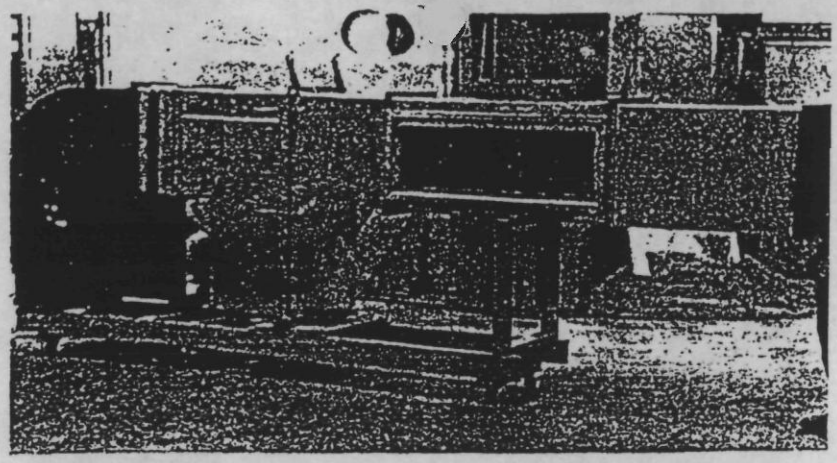

Fig. 3. Testing apparatus designed to determine the amount of dusting of mineral fiber fireproofing material in return air plenums.

mineral fiber dust, humidity and other unrelated factors.

Tests conducted at the Kodaras laboratory on certified samples from member companies of the Association fell within the GSA requirement that dusting shall not exceed 0.025 grams per sq ft. Dusting rates were between 0.0007 and 0.02 grams per sq ft per 24-hour period. Tests conducted for periods longer than 24 hours revealed that dusting is nonlinear with time and decays exponentially.

Testing Procedure

The testing apparatus built by the laboratory is shown in Fig. 3. It was operated in an airtight room. Air velocity was adjusted by a slide damper between the fan discharge and system filter and by closing the fan intake. The system filter, installed upstream of the test specimen, was a commercial, reinforced, nonwoven, treated fabric media with a rated efficiency in accordance with GSA specifications.

The test specimen, 16 × 48 in. in size, was located downstream of the system filter. It was mounted so that 4.07 sq ft of the surface of the sample was parallel with the inside of the duct. The black cloth collection filter, which was also in accordance with GSA specifications, was positioned downstream of the test specimen. Another duct section behind the collection filter maintained a smooth airflow while eliminating the induction of room air at the collection filter.

The test required an air movement of about 2300 cfm, or a total of approximately 3 million cu ft in 24 hours. As the airtight test room had a volume of about 4000 cu ft, air was circulated through the test apparatus (system filter) for about three hours to remove all dust particles that could affect test results.

The test specimen was then installed in the apparatus and the air velocity adjusted to 800 fpm to meet the required six-hour purge of the surface of the specimen. The purpose of this procedure was to simulate the operation and balancing of air conditioning systems which purges plenums and ductwork of accumulated construction dust and debris.

The procedure developed for weighing the collection filter before and after a test consisted of placing a small single graduate

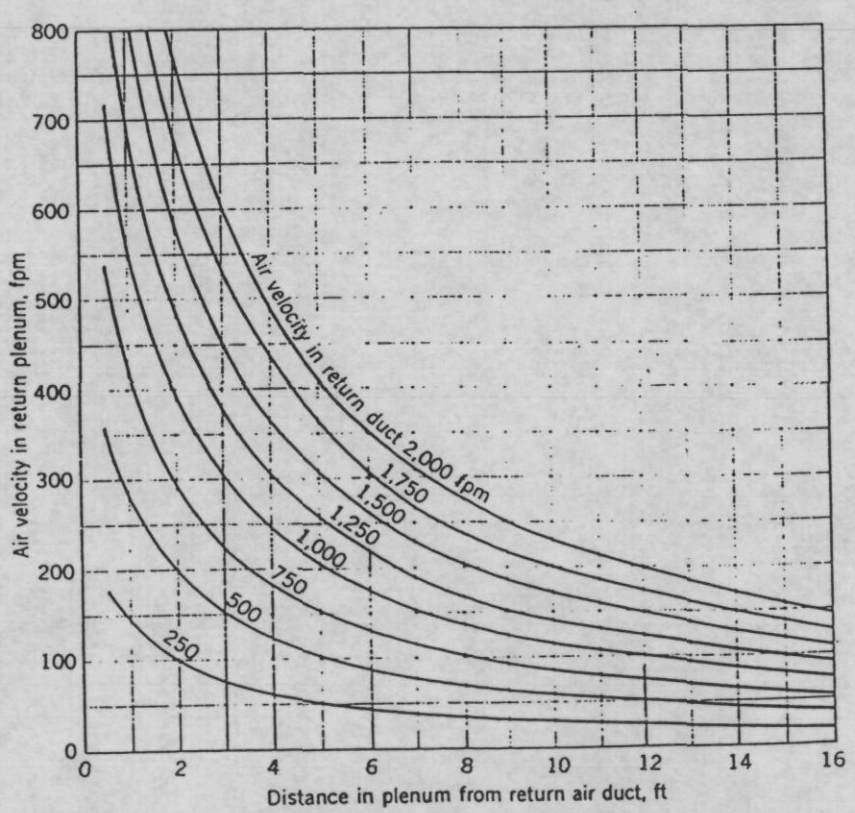

Fig. 4. Relationship of air velocity in return plenum to the distance from return air duct for various return duct velocities.

balance, having a sensitivity of one milligram, in a dust-free cabinet with a controlled temperature of 120F. The before and after weight was observed until no reduction in weight occurred for two or three checks. It was then assumed that the humidity of the filter material was at equilibrium.

It is important to note that the test procedure velocity of 800 fpm is far in excess of the air velocity in a building return air plenum. Thus, it is, in effect, a time-accelerated test.

Analysis of a few typical return air plenums indicates that velocity of return air may vary from 2-10 fpm over the major portion of the ceiling area. Most air conditioning systems in office buildings supply from 1-4 cfm per sq ft of occupied space. As the plenum usually has a free height (from back of ceiling to bottom of beams) of at least 1 ft, the return flow takes place in a simulated duct approximately equal in size to the occupied area multiplied by the free height of the plenum. The velocity increases as the distance to the return air collection duct decreases. See Fig. 4.

An exception to these very low plenum velocities occurs in the immediate vicinity of the return air collection duct, over an area of about 2 sq ft of sprayed mineral fireproofing.

It is possible that other materials in the circulating system of a building may contribute as much or more dust to the system. This test method could be applied to duct linings, plenum linings, silencer facing and similar materials that are installed in portions of the system where airflow is far in excess of 2-10 fpm. ▲▲▲

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